

Notes on the Hawaiian Frigate Mackerel of the Genus *Auxis*

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A NEW DISTRIBUTION RECORD for a long-corseletted frigate mackerel of the genus *Auxis* was established on November 30, 1957, with the capture of 21 specimens in the central Pacific Ocean. These fish were taken from the same school together with five short-corseletted frigate mackerels. The catch was made from the research vessel "John R. Manning" of the Pacific Oceanic Fishery Investigations (POFI), by pole-and-line fishing, one mile offshore, two miles northwest of Cape Kaea, Lanai. Although the long- and short-corseletted *Auxis* are known from both sides of the Pacific, only the short-corseletted form has been reported heretofore from the central Pacific area.

As is the case with some of the other scombrids, the taxonomy of this genus is not very clear. Although the identity of the short-corseletted form has been well established as *A. thazard* (Lacépède 1802), the nomenclature of the long-corseletted form has been confused because of incomplete description and subsequent misnaming by other workers. It is hoped that this paper will help to clarify the nomenclature of this genus.

The long-corseletted form of the western Pacific has been identified by various names. Kishinouye (1915: 13-14) recognized two species of *Auxis* in Japanese waters, to which he ascribed the names *A. hira* and *A. maru*. The former species was described as having a short corselet which ended slightly posterior to the pectoral fin, whereas the latter was described as having a long corselet which extended to the anal fin. Under the description of the latter species, Kishinouye stated that "Bleeker's *tapeinosoma* may also be this species, but the figure and description of this species are very rough and unclear." In recent years Herre and Herald (1951: 319) and Wade (1949: 229) applied the name *tapeinosoma* to the Philippine

long-corseletted form. A review of Bleeker's original description (1854: 408), however, discloses that *tapeinosoma* is definitely a short-corseletted form, for according to him the corselet ends "slightly posterior to the pectoral fins." This character agrees with the short corselet of *thazard* and *hira*, and therefore, *tapeinosoma*, as used by Herre and Herald, and by Wade, in identifying the long-corseletted species is a misnomer.

The appropriate name for the western Pacific long-corseletted species seems to be *A. thynnoides* Bleeker. Examination of Bleeker's (1855: 301) original description of the type specimen which was taken at Ternate, East Indies, and which is now in the Leiden Museum, clearly indicates that his specimen is the long-corseletted form, for he states that the corselet along the lateral line ends "far behind the pectoral fin." The writer's interpretation of Bleeker's description is confirmed by John E. Fitch (through private correspondence), who has checked the type specimen. It is apparent from the original description and from Fitch's information that *thynnoides* is the earliest available name for the western Pacific long-corseletted species. The Hawaiian form described here is identical with that from the Philippine waters and agrees well with the type specimen described by Bleeker. Consequently, it is given the name *A. thynnoides* Bleeker.

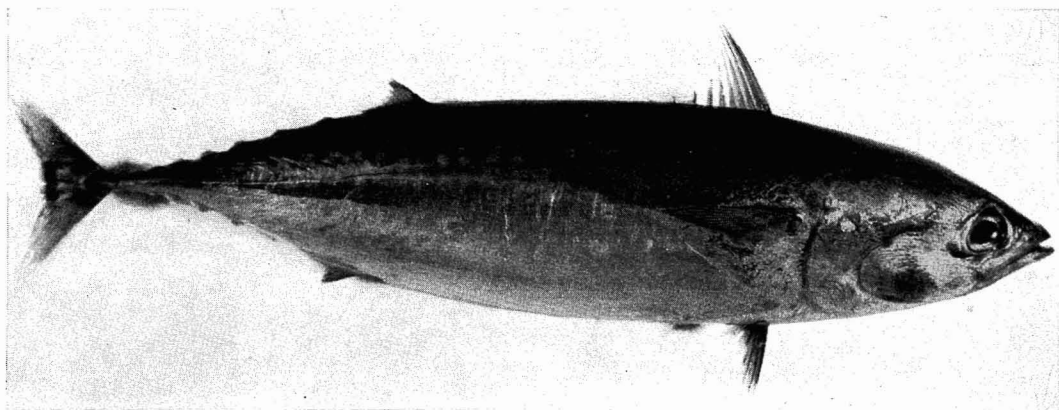
A. thazard has been described many times by previous workers. Nevertheless, in order to facilitate the comparison between this species and *thynnoides*, the descriptions of both are presented.

DESCRIPTIONS OF SPECIES

Auxis thynnoides Bleeker Fig. 1

This description is based on 20 specimens which are now deposited at the POFI laboratory, Honolulu, Hawaii.

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FIG. 1. *Auxis thynnoides* Bleeker.

Dorsal X-XI, 10-11, 8. Anal 12-13, 7. Gill rakers $10-11 + 1 + 32-36 = 43-48$. Total length 262-290 mm.

Body robust, fusiform, almost cylindrical in cross section. Snout short, pointed. Mouth moderate; gape to slightly past anterior margin of pupil. Each jaw with single row of small, weak teeth. Palatines and vomer toothless. Dorsal fins well separated. Dorsal interspace slightly greater than half the distance between origins of first and second dorsals.

Vertebrae $20 + 19 = 39$, including urostyle. First haemal arch on 8th vertebra; first closed haemal arch and first haemal spine on 21st vertebra. Haemal canal borne away from body of vertebra by pedicles [of Starks (1910: 97) = epihaemal processes of Kishinouye (1923: 460)].

Body naked, except for corselet of scales. Corselet along lateral line extends beyond vertical through posterior end of second dorsal. Corselet 16-18 scale-rows wide below origin of second dorsal fin. Lateral line more or less undulating, without any pronounced arch.

Body markings consist of 14-16 dark, nearly vertical bars over bluish background above lateral line. Bars often broken into spots. Dark continuous band over top of head and along dorsal margin of body. The band more or less uniform in width to end of second dorsal, whence it narrows posteriorly to base of caudal fin. Body below lateral line silvery white and free of markings or spots.

Auxis thazard (Lacépède)

Fig. 2

This description is based on five specimens which are deposited at the POFI laboratory, Honolulu, Hawaii.

Dorsal XI, 10-12, 8. Anal 13, 7. Gill rakers $9-10 + 1 + 28-31 = 39-42$. Total length 272-283 mm.

Body robust, more or less compressed laterally. Snout short, pointed. Mouth moderate; gape to well past anterior edge of pupil. Each jaw with single row of small, weak teeth. Palatines and vomer toothless. Dorsal fins well separated. Dorsal interspace less than half the distance between the origins of the first and second dorsals.

Vertebrae $20 + 19 = 39$, including urostyle. First haemal arch on 8th vertebra; first closed haemal arch and first haemal spine on 21st vertebra. Haemal canal borne away from body of vertebra by pedicles.

Body naked, except for corselet of scales. Corselet along lateral line extends posteriorly to about two-thirds the distance from the origin of first dorsal to the origin of second dorsal. Lateral line only one or two scale-rows wide beneath second dorsal origin. Lateral line more or less undulating, without any pronounced arch.

Body markings about 16 dark, oblique bars running posterodorsally and overlying bluish background above lateral line. Bars variable in number and often broken into spots. Dark continuous band over top of head and along dorsal

margin of body. The band more or less uniform in width to above tip of pectorals whence it narrows posteriorly to base of second dorsal finlet. Body below lateral line silvery white and free of markings or spots.

DISCUSSION

Several distinguishing characters are noted in the two types of *Auxis* described here. The most obvious of these is the corselet formation along the lateral line. In *thazard* the corselet narrows abruptly toward the lateral line and ends at about two-thirds of the distance from the origin of the first dorsal to the origin of the second dorsal fin. On larger specimens, 350 to 400 mm. long, according to Wade (1949: 234), the corselet tapers less rapidly than in smaller specimens, but in no case does it extend to the level of the second dorsal origin. In contrast to this the corselet of *thynnoides* tapers very gradually and terminates between the first and second dorsal finlet. In the Hawaiian specimens the corselet is still 16 to 18 scale-rows wide beneath the origin of the second dorsal fin. In the smaller Philippine specimens, whose total lengths range between 195 and 235 mm., the corselet beneath the second dorsal fin is from 9 to 15 scale-rows wide.

Upon examining the corselet of these specimens, it was noticed that the largest scales were adjacent to the lateral line, and that the size of the scales diminished on each succeeding scale-row away from the lateral line. From this ob-

servation and also from the previous one, that the larger Hawaiian specimens have more scale-rows than the smaller Philippine specimens, it was suspected that the width of the corselet increased with growth of the fish. An analysis of the regression of number of scale-rows on fish length (Hawaiian and Philippine material combined) yielded the equation, $Y = 0.078X - 4.55$, which is shown graphically in Figure 3. The highly significant regression coefficient ($b = 0.078$; $t = 12.14$, $P < 0.001$, at 19 degrees of freedom) indicates that the number of scale-rows increases as the body length does, and that therefore, the variation in corselet width between the Philippine and Hawaiian specimens represents growth rather than a species difference.

An interesting character, one which has seldom been used previously in separating the two forms of *Auxis*, is the configuration of body markings. In both species the dorsal half of the body contains a number of dark bars. Although these bars vary in number and are sometimes broken into spots, their position on the body is distinctive. In *thazard* the bars lie obliquely in a posterodorsal direction. In addition to these bars, the dorsal surface of the body is marked with a dark longitudinal band which is as wide as the interorbital space and which extends evenly from the snout to above the tip of the pectoral fin. It then tapers gradually to about the base of the second dorsal finlet. In *thynnoides*, on the other hand, the bars lie in a more

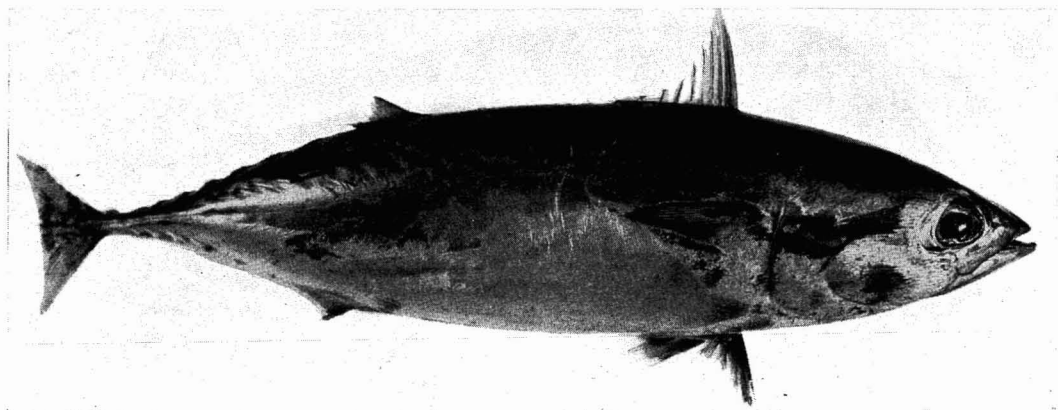


FIG. 2. *Auxis thazard* (Lacépède).

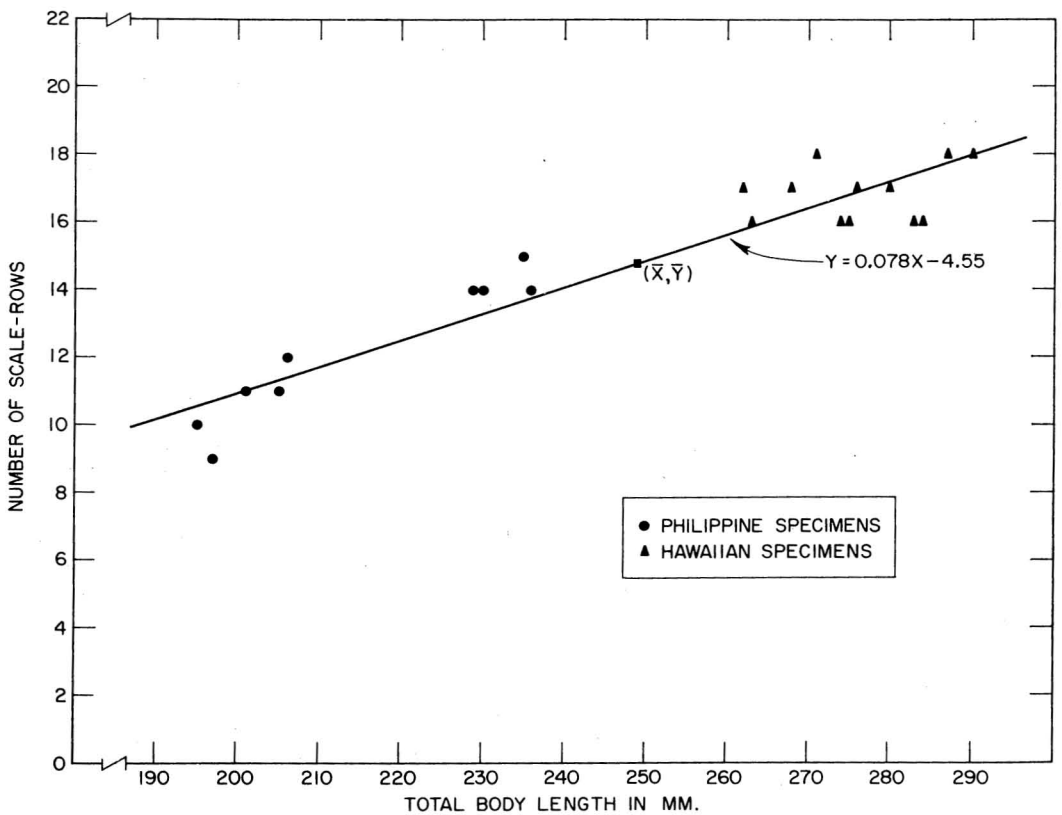


FIG. 3. Regression of the number of scale-rows on total body length of *Auxis thynnoides*.

or less vertical direction, and the dark longitudinal band on the dorsal surface of the body does not taper noticeably until it reaches the end of the second dorsal fin, whence it continues to the base of the caudal fin, tapering very gradually.

Another character often mentioned by investigators in separating the two forms of *Auxis* is the difference in the roundness of the body. In both species the ratios of body length (fork length) to body width are nearly identical (6.04 to 6.56 in *thazard*; 6.02 to 6.58 in *thynnoides*); however, the ratio of body length to body depth of *thynnoides* (4.55 to 4.98) is greater than that of *thazard* (4.32 to 4.56). Consequently, *thynnoides* appears fusiform, whereas *thazard*, because of its greater depth, appears laterally compressed. In visual comparison, this difference is so slight that it requires an unusually keen

observer or one who has had practice in this observation to notice the difference.

Nearly all of the characters examined on the two species exhibit very small differences which are difficult to recognize in the field. Even the relatively more obvious corselet difference would elude detection unless the observer was looking for it specifically. This being the case, the question arises as to whether *thynnoides* was present in these waters previous to this capture but was undetected, or whether its recent capture indicates a movement of this fish into the area.

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